USER MANUAL

AX2065A

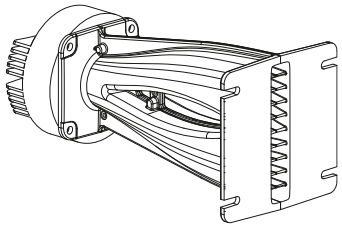
active vertical array loudspeaker

KEY FEATURES

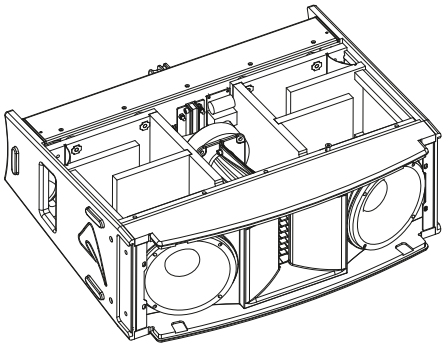
- High output line array element
- Compact size, very good output-to-weight ratio
- High quality, low compression, low distortion HF driver
- Very stable horizontal coverage
- Transmission Line back loading for clean mid-bass reproduction
- Natural sound Transmission Line HF projection wave-forming device
- 96KHz / 40 bit floating point CORE processing with PRONET remote control
- Digitally controlled Class D amplifier module with SMPS

INTRODUCTION

The AX2065A Vertical Line Array element is designed for a wide range of sound reinforcement applications where a flexible and easy to use vertical array systems is needed. The AX2065A has been designed both for rental live sound applications and for fixed installations and has been engineered for the simplest use possible but without sacrificing anything in sound quality and performance.



The high frequency range is reproduced by a low-distortion compression driver, equipped with very light-weight Titanium diaphragms and a special new suspension design for very natural sound. A transmission line wave-forming waveguide has been used to load the HF driver, in order to provide a detailed and natural sound and to achieve a long-distance HF projecting capacity.



The two 6.5” woofers are back loaded by a short hybrid transmission line that minimizes the effect of the box resonances and eliminates the “boxy” mid-bass sound commonly obtained from regular bassreflex enclosures.
The AX2065A is processed by 40bit, 96kHz floating point CORE DSP and powered by DA SERIES digital power modules, a new generation of CLASS D power amplifier with digitally-controlled SMPS. The DA module employed for powering the AX2065A delivers in an ultra-compact package a maximum power of 2000W and each AX2065A is able to power an additional passive AX2065P module through the available power output on the back panel. This feature will allows to assemble very competitive hybrid solutions both for rental and installation applications.

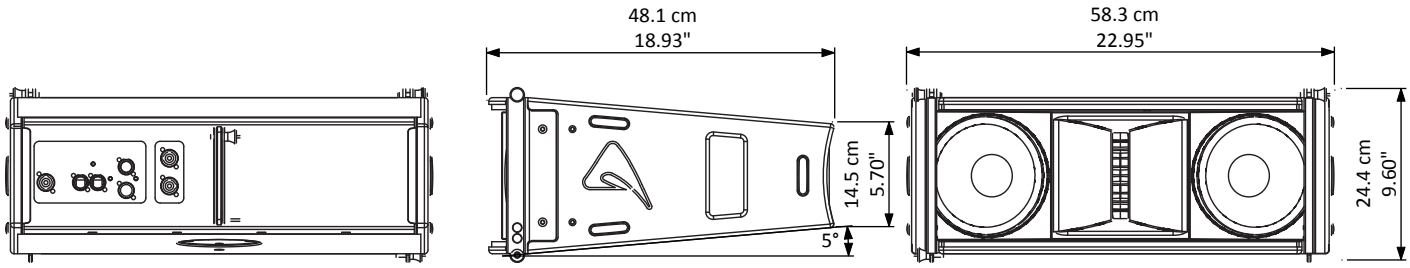
TECHNICAL SPECIFICATION

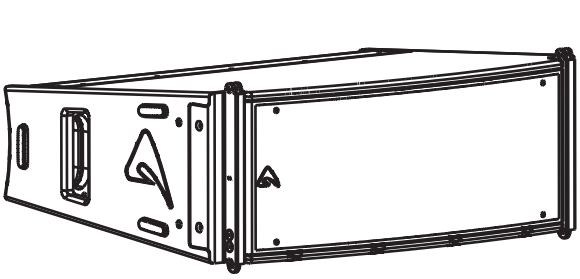
Acoustical	
System type	Line Array Element Short Transmission Line LF Back Loading Acoustic Transmission Line HF Waveguide
Low frequency transducer	Two 6.5” (165 mm), 1.5” (38 mm) aluminium voice coil, 16Ω each, paralleled
High frequency transducer	One 1.4” driver, 2.5” (64 mm) edgewound voice coil, titanium diaphragm, 8Ω each, paralleled
Frequency response (±3 dB)	80 Hz – 18 kHz (Processed)
Horizontal Coverage Angle	110° (-6 dB)
Vertical Coverage Angle	12° (-6 dB)
Maximum Peak SPL @ 1m	129 dB
Electrical	
Input Impedance	20 kΩ balanced
Input Sensitivity	+4 dBu / 1.25 V
Signal Processing	CORE processing, 96kHz / 40bit floating point SHARC DSP, 24 bit AD/DA converters
Direct access Controls	4 Presets: Standard, Long Throw, Down Fill-Single Box, User. Network Termination, GND Link
Remote Controls	PRONET control software
Network protocol	CANBUS
Amplifier Type	Class D with Variable Switching Frequency and SMPS
Output Power	2x 1000 W
Mains Voltage Range (Vac)	230 V~ ±15% or 115 V~ ±15% 50/60 Hz
Mains Connector	PowerCon® (NAC3MPA + NAC3MPB)
Consumption*	700 W (nominal) 1700 W (max)
IN / OUT Connectors	Neutrik XLR-M / XLR-F / Speakon NL4MP
IN / OUT Network Connectors	ETHERCON® (NE8FAV)
Mechanical	
Width	583 mm (22.95”)
Height	244 mm (9.60”)
Depth	481 mm (18.93”)
Taper angle	5°
Construction	15 mm, reinforced Phenolic Birch
Paint	High resistance, water based paint
Suspension system	
Front Suspension	Aluminium Fast Link structure with ¼ Fast Pin
Back Suspension	High Strength Steel with ¼ Fast Pin
Net Weight	22.5 Kg (49.6 lbs.)

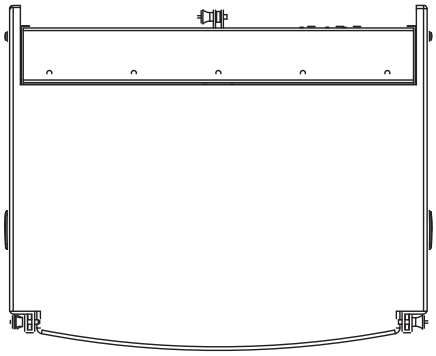
** Nominal consumption is measured with pink noise with a crest factor of 12 dB, this can be considered a standard music program.*

AXIOM

MECHANICAL DRAWING





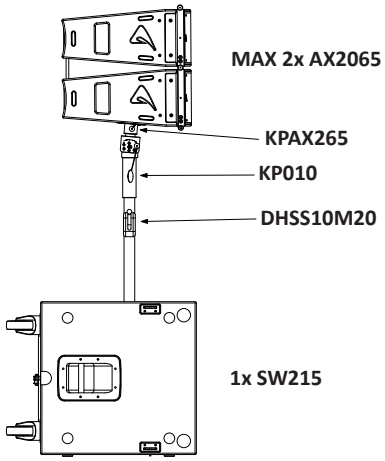


OPTIONAL ACCESSORIES

AXCASE05	Carrying Case for 4 box unit + Flying Bar	**AX2065P**	Passive vertical array loudspeaker
AXCASE06	Carrying Case for 4 box unit	**USB2CAN**	PRONET network converter
NAC3FCA	Neutrik Powercon® BLUE PLUG	**KPTSW215**	Fly bar for Axiom AX2065 and SW215 Loudspeakers
NAC3FCB	Neutrik Powercon® WHITE PLUG	**KPTAX2065**	Fly bar for Axiom AX2065 only
NE8MCB	Neutrik Ethercon PLUG	**BOARDAC2P**	M10 foot for stacked installation
NC3MXXBAG	Neutrik XLR-M	**KPAX265**	Pole Adaptor
NC3FXXBAG	Neutrik XLR-F	**KP010**	0° to 10° tilt adaptor
SW215A	Active Subwoofer	**DHSS10M20**	Sub-Speaker ø35mm Pole with M20 screw
SW215AF	Flyable Active Subwoofer		

*see **www.proel.com** for detailed description and other available accessories.*

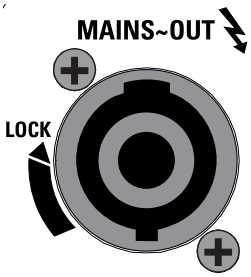
AX2065 used as conventional system



SPARE PARTS

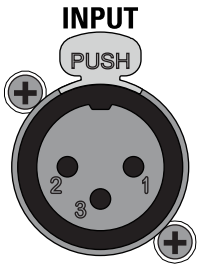
NAC3MPA	Neutrik Powercon® BLUE SOCKET	**91DSPKT3**	Input & DSP module with panel assembly
NAC3MPB	Neutrik Powercon® WHITE SOCKET	**98AXM6W16**	6.5'' woofer - 1.5" VC
94SPI2265	Locking Pin for AX2265	**98DRI2065**	1.4'' - 2.5" compression driver
PLG716	Straight Shackle 16 mm for Fly bar	**98MBN2065**	titanium diaphragm for 1.4" driver
91AMD2065	Power amplifier module with mechanical assembly		

I/O AND CONTROL OPERATIONS

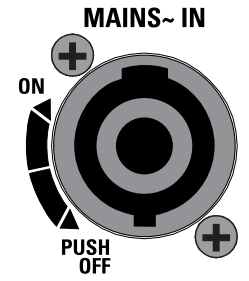


MAINS IN - Powercon® NAC3FCA power input connector (blue). To switch the amplifier on, insert the Powercon® connector and turn it clockwise into the ON position. To switch the amplifier off, pull back the switch on the connector and turn it counter-clockwise into the POWER OFF position.

WARNING! In the case of product failure or fuse replacement, disconnect the unit completely from the mains power. The power cable must only be connected to a socket corresponding to the specifications indicated on the amplifier unit. The power supply must be protected by a suitably rated thermo-magnetic breaker. Preferably use a suitable switch to power on the whole audio system leaving the Powercon® always connected to each speaker, this simple trick extend the life of the Powercon® connectors.



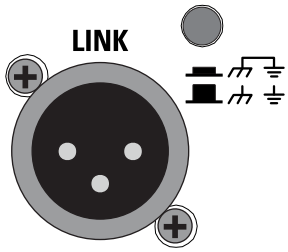
MAINS OUT - Powercon® NAC3FCB power output connector (grey). This is connected in parallel with the MAINS ~ / IN. The maximum load applicable depends on the mains voltage. With 230V~ we suggest to link a maximum of 4 AX2065A loudspeakers, with 120V~ we suggest to link a maximum of 2 AX2065A loudspeaker.



INPUT - Audio signal input with locking XLR connector. It has a fully electronically balanced circuitry including AD conversion for the best S/N ratio and input headroom.

LINK - A direct connection from the input connector to link other speakers with same audio signal.

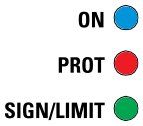
ON - This LED indicates power on status.

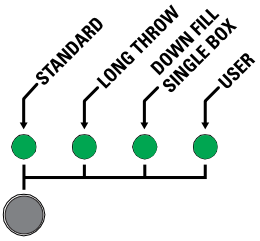


PROT - This red LED lights when the amplifier module is in protect mode for an internal fault and, consequently, the amplifier is muted.

SIGN/LIMIT - This LED lights in green to indicate the presence of the signal and lights in red when an internal limiter reduces the input level.

GND LIFT - This switch lift the ground of the balanced audio inputs from the earth-ground of the amplifier module.

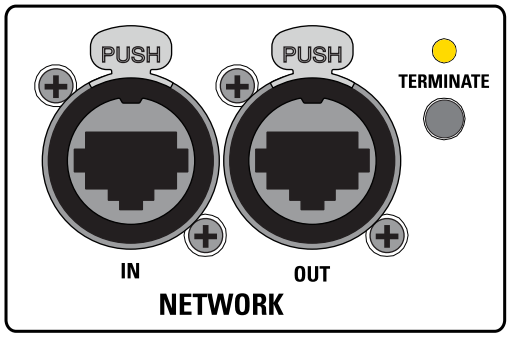




PRESET BUTTON - This button has two function:

1) Pressing it while powering on the unit:

ID ASSIGN the internal DSP assigns a new ID to the unit for the PRONET remote control operation. Each loudspeaker must have a unique ID to be visible in the PRONET network. When you assign a new ID, all the other loudspeakers with the ID already assigned must be ON and connected to the network.



2) Pressing it with the unit ON you can select the DSP PRESET. The selected PRESET is indicated by the corresponding LED:

STANDARD This PRESET is suitable for vertical flown arrays that may range from 4 to 8 boxes or for the centre region of a bigger flown array. It can be used also for stacked arrays.

LONG THROW This PRESET can be used in arrays bigger than 6 or 8 boxes and loaded in the top 1 or 2 boxes in order to obtain a more even distribution of the sound pressure, especially if they point very far away or to the upper deck of a large theatre.

DOWN FILL / SINGLE BOX This PRESET, which features a much smoother high frequency response, can be loaded in the bottom boxes (usually 1 or 2 boxes) of a large flown array, in order to reach conveniently the audience close to the stage. This preset could be very useful also when the box is used just on its own as a Front Fill element in the front of very large stages.

USER This LED lights when the USER PRESET is loaded. This preset corresponds to USER MEMORY no. 1 of the DSP and, as a factory setting, it's the same to STANDARD. If you want to modify it, you have to connect the unit to a PC, edit the parameters with PRONET software and save the PRESET into USER MEMORY no. 1. *Note: see also the PRONET example further on this manual.*

MF> 1+/1-
HF> 2+/2-

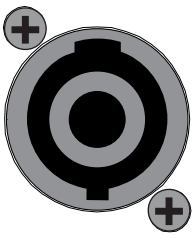
NETWORK IN/OUT - These are a standard RJ45 CAT5 connectors (with optional NEUTRIK NE8MC RJ45 cable connector carrier), used for PRONET network transmission of remote control data over long distance or multiple unit applications.

TERMINATE - In a PRONET network the last loudspeaker device must be terminated (with an inner load resistance) especially in a long run cabling: press this switch if you want to terminate the unit.

POWER OUT - AX2065A is able to power an additional passive AX2065P module through the available power output on the back panel.

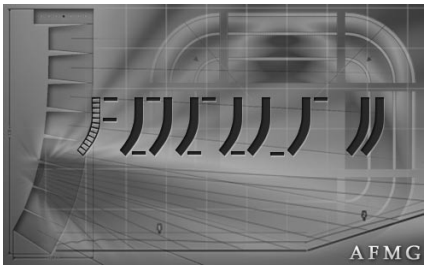
POWER OUT
AX2065P ONLY

WARNING: connect a single AX2065P module only.



MIN. LOAD 8 Ω

AIMING and SUSPENDING INSTRUCTIONS



PREDICTION: EASE Focus 2

To aim correctly a complete system we suggests to use always the Aiming Software - **EASE Focus 2**:
The **EASE Focus 2 Aiming Software** is a 3D Acoustic Modelling Software that serves for the configuration and modelling of Line Arrays and conventional speakers close to reality. It only considers the direct field, created by the complex addition of the sound contributions of the individual loudspeakers or array components.
The design of EASE Focus is targeted at the end user. It allows the easy and quick prediction of the array performance in a given venue. The scientific base of EASE Focus stems from EASE, the professional electro- and room acoustic simulation software developed by AFMG Technologies GmbH. It is based on the EASE GLL loudspeaker data file required for its use: **AXIOM_AX Series_v2_0.GLL**, please note that the version must be 2.0 or more. The GLL file contains the data that defines the Line Array with regard to its possible configurations as well as to its geometrical and acoustical properties. For detailed explanation of how to use the software and how to obtain a correct aiming refer to EASE Focus documentation and other on-line manuals (http://focus.afmg.eu/index.php/fc-software-en.html).

WARNING! CAREFULLY READ THE FOLLOWING INSTRUCTIONS AND CONDITION OF USE:

- This loudspeaker is designed exclusively for Professional audio applications. **The product must be installed by qualified personal only**.
- Proel strongly recommends that this loudspeaker cabinet be suspended taking into consideration all current National, Federal, State and Local regulations. Please contact the manufacturer for further information.
- Proel do not accept any liability for damage caused to third parties due to improper installation, lack of maintenance, tampering or improper use of this product, including disregard of acceptable and applicable safety standards.
- During assembly pay attention to the possible risk of crushing. Wear suitable protective clothing. Observe all instructions given on the rigging components and the loudspeaker cabinets. When chain hoists are in operation ensure that there is nobody directly underneath or in the vicinity of the load. Do not under any circumstances climb on the array.

KPTSW215 Fly Bar and accessories

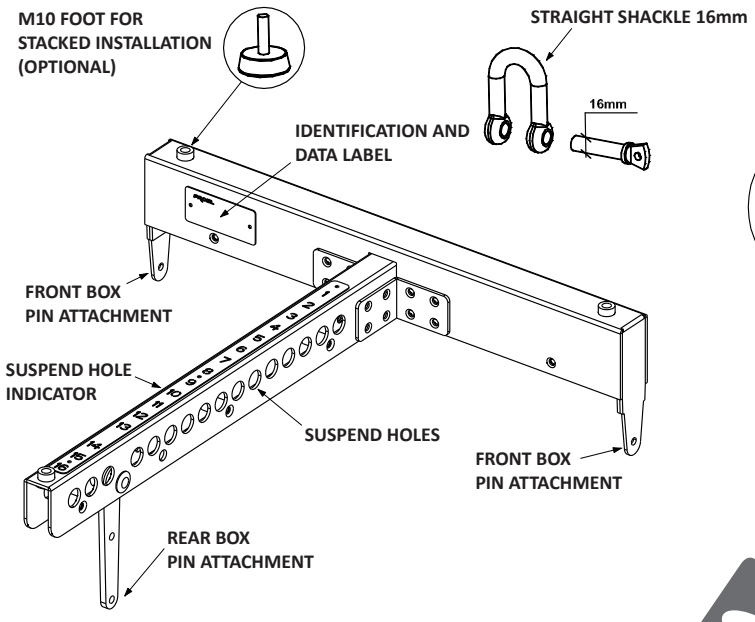
The AX2065 Systems are built to allow the suspension of array with variable shape and dimensions. Thanks to a suspension mechanism designed to be functional, flexible and safe, each system must be suspended or stacked using the **KPTSW215** fly bar. The loudspeakers are linked together in a column using a series of couplers integrated in the frame of each enclosure. Each system is set up properly both acoustically and mechanically only using the aiming software.
Coupling system in the front does not require any adjustment: using two locking pins, each loudspeaker box is fixed to the previous. The slotted bar in the back is inserted in a U-shaped frame which features a series of numbered holes. Sliding the slotted bar in the U-shaped frame of the next loudspeaker and inserting a locking pin in one of the numbered holes, it is possible to adjust the relative splay angle between two adjacent loudspeakers in the array column.

KPTSW215 fly bar maximum capacity is 540 Kg (1190 lbs) with the 0° angle. It can support, with a safety factor of 10:1, up to:

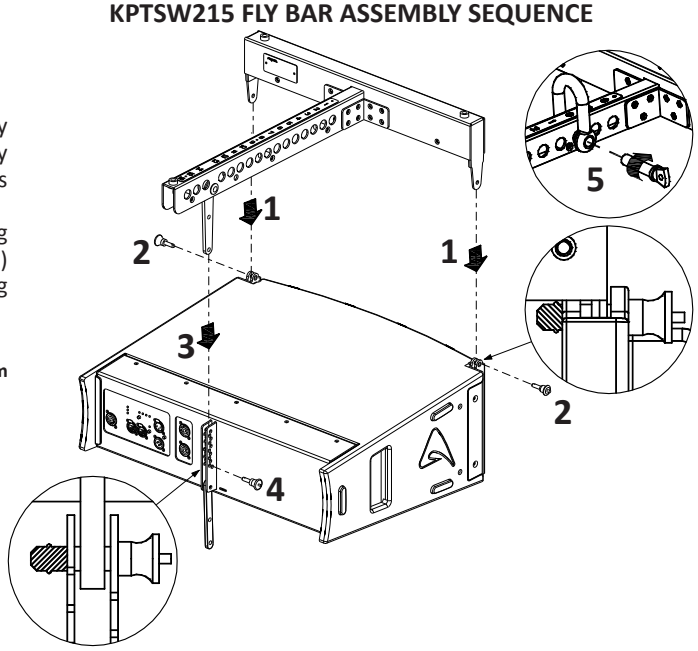
- **8 AX2065A + 8 AX2065P (flybar from 0° to 10°)**
- **12 AX2065A (flybar from 0 to 10°)**
- **2 SW215AF + 4 AX2065A + 4 AX2065P (flybar at 0°)**
- **2 SW215AF + 8 AX2065A (flybar at 0°)**
- **6 SW215AF (flybar from 0° to 5°)**

Follow the sequence in the figure for fixing the fly bar at the first box. Usually this is the first step before lifting up the system. Be careful to insert properly all the locking pins (1)(2) and (3)(4) then the shackle (5) in the right holes as specified by the aiming software.
When lifting the system always proceed gradually step by step, paying attention to secure the fly bar to the box (and the box to the other boxes) before pulling up the system: this makes easier to insert properly the locking pins. Also when the system is released down, unlock gradually the pins.
During the lifting be very careful to not let the cables enter the space between one enclosure and the other, as their compression could cut them.

KPTSW215 FLY BAR AND ACCESSORIES

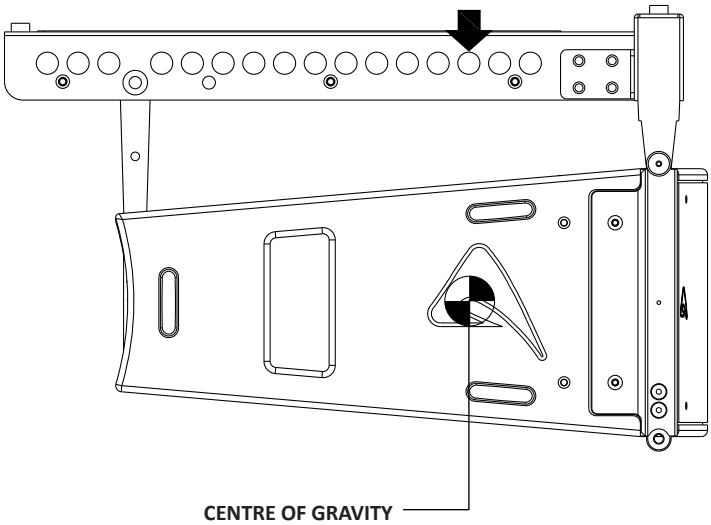


KPTSW215 FLY BAR ASSEMBLY SEQUENCE

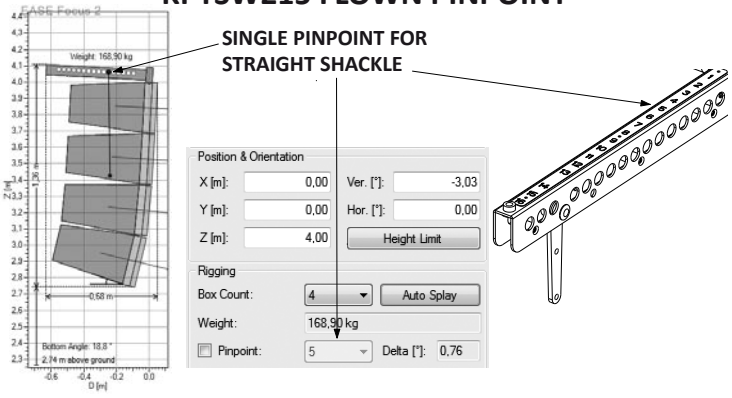


Fly bar suspension and angle setup (centre of gravity)
The first figure shows where the normal centre of gravity is with one box or several boxes arranged in a line. Usually the boxes are arranged to make an arc for the best coverage of the audience, so the center of gravity moves backward. The aiming software suggests the ideal suspension pinpoint taking into account this behaviour: fix the straight shackle in this position.

KPTSW215 FLY BAR FOR FLOWN ARRAY



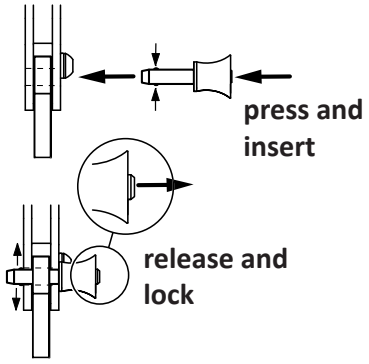
KPTSW215 FLOWN PINPOINT



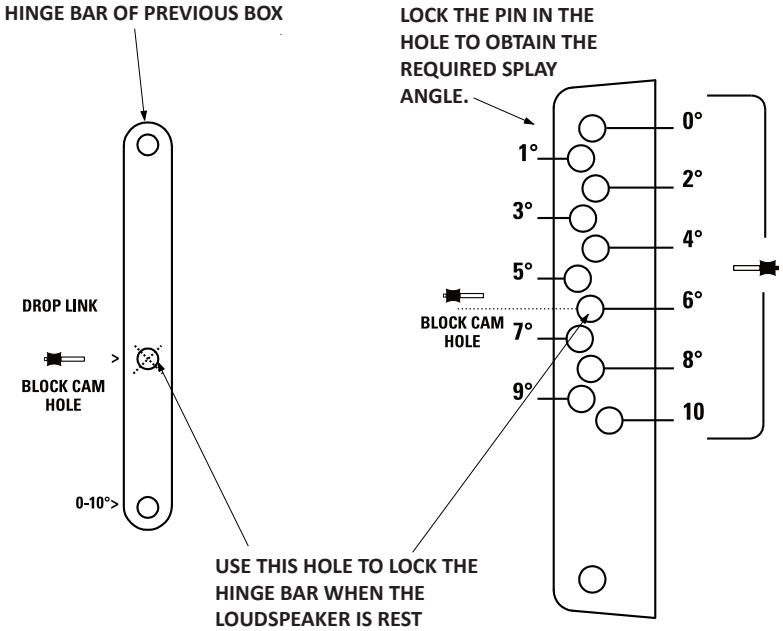
Note that the ideal aiming angle often doesn't correspond to the pinpoint: there is often a little difference between ideal aiming and real aiming and its value is the Delta angle: positive delta angle can be adjusted a little using two ropes, negative delta angle are self adjusted a little because the cables weighs on the back of the array. With some experience it's possible to consider preventively these required little adjustments.
During the flown set up you can connect the elements of the array to their cables. We suggest to discharge the weight of the cables from the flying pinpoint by tying them with a textile fibre rope, instead of letting them hang freely: in this way the position of the array will be much more similar to the simulation produced by the software.

Pin locking and splay angles set up
The figure below shows how to insert correctly the locking pin and how to set up the splay angle between loudspeakers.

95AXM014 LOCKING PIN



LOUDSPEAKER SPLAY ANGLES SET UP



Wind loads
When planning an open-air event it is essential to obtain current weather and wind information. When loudspeaker arrays are flown in an open-air environment, possible wind effects must be taken into account. Wind load produces additional dynamic forces acting on the rigging components and the suspension, which may lead to a dangerous situation. If according to the forecast wind forces higher than 5 bft (29-38 Km/h) are possible, the following actions have to be taken:
- The actual on-site wind speed has to be monitored permanently. Be aware that wind speed typically increases with height above ground.
- Suspension and securing points of the array should be designed to support double the static load in order to withstand any additional dynamic forces.

WARNING!
Flying loudspeakers overhead at wind forces higher than 6 bft (39-49 Km/h) is not recommended. If the wind force exceeds 7 bft (50-61 Km/h) there is a risk of mechanical damage to the components which may lead to a dangerous situation for persons in the vicinity of the flown array.
- Stop the event and make sure that no person remains in the vicinity of the array.
- Lower and secure the array.

Stacked installation

WARNING!

• The ground where the KPTSW215 Fly bar serving as ground support is placed needs to be absolutely stable and compact.

• Adjust the feet so to lie the bar perfectly horizontal.

• Always secure ground stacked setups against movement and possible tipping over.

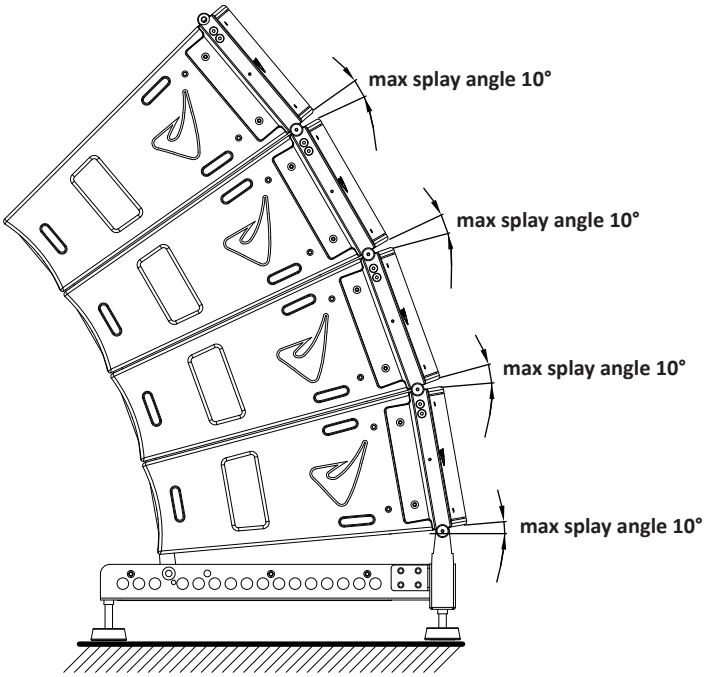
• A maximum of 4 x AX2065 cabinets with the KPTSW215 Fly bar serving as ground support are allowed to be set up as ground stack.

In the stack configuration you have to use the three optional BOARDAC2P feet and the fly bar must be mounted upside down on the ground.

Coupling system in the front do not require any adjustment: using two locking pins each loudspeaker box is fixed to the previous. The slotted bar in the back is inserted in a U-shaped frame which features a series of numbered holes. Sliding the slotted bar in the U-shaped frame of the next loudspeaker and inserting a locking pin in one of the numbered holes, it is possible to adjust the relative splay angle between two adjacent loudspeakers in the array column.

The optimal splay angles can be simulated using the EASE Focus 2 software.

KPTSW215 STACKED ARRAY



POWER AMPLIFIERS

The AX2065A is powered by DA SERIES digital power modules, a new generation of CLASS D power amplifier with digitally-controlled SMPS.
The innovative technology used for these amplifiers (including also the use of a variable switching frequency) offers performances at the top of the range, such as a superior sound definition at any audio frequency, very high dynamics also for low level signals and very low distortion even at the maximum power The superior sound quality can be compared with top-of-the-range AB-class analog systems, while the DA modules feature a higher dynamics, very compact size and light weight and efficiency above 90%. The DA module employed for powering the AX2065A deliver in an ultra-compact package a maximum power of 2000W, 1000W are delivered to the internal speakers, the other 1000W are delivered to the AX2065P connected in parallel using the POWER OUT speakon connector.

SIGNAL PROCESSING

The system processing is based on the CORE DSP platform, which has been designed by the PROEL R&D Laboratories using one of the most advanced SHARC DSP for audio application. It features 40bit, 96kHz floating point resolution and high quality 24bit AD/DA converters, for a perfect signal integrity, a dynamic range in excess of 110dB and a superior sonic performance. Thanks to its massive processing power, the CORE platform is capable of providing the most sophisticated algorithms for speaker processing, together with remote control and networking capability.
The PRONET control software, working on a solid and reliable CANBUS based network protocol, provides an intuitive interface for the remote control of the whole system, with the possibility of eqing, delaying, increasing the protections and monitoring the status of the amplifier.

PRONET Network

PRONET software has been developed in collaboration with sound engineers and sound designers, in order to offer an “easy-to-use” tool to setup and manage your audio system. With PRONET you can visualize signal levels, monitor internal status and edit all the parameters of each connected device.
You can download the PRONET software from the PROEL website at http://www.proel.com (click on the link in the AX2065A product page).

The AXIOM active loudspeaker devices can be connected in a network and controlled by the PRONET software. For the network connection the PROEL USB2CAN converter optional accessory is needed. The first time you connect a device with the USB2CAN converter, Windows O.S. will ask you to install the driver files, which you can find in the Driver folder within the Pronet application folder (by default is C:\Program Files\Proel\Pronet\Driver, or if you changed it <your path>\Driver). Please refer also to “Installation” and “Drivers” paragraphs in the Pronet documentation.
The PRONET NETWORK is based on a robust, reliable and fast communication protocol called CANBUS. The devices in a PRONET NETWORK are connected together with a “linear bus topology”. The USB2CAN converter must be connected to the network input of the first device, the network output of the first device is connected to the input of the second and so on. For the network connections simple RJ45 cat.5 or cat.6 ethernet cables can be used (please don’t confuse a ethernet network with a PRONET network these are completely different and must be fully separated also both use the same kind of cable).
The beginning and the end of a PRONET NETWORK must be terminated. One side is terminated by the USB2CAN converter, the other side must be terminated pressing the TERMINATE switch on the last device. All devices between these two points must have the TERMINATE switch lifted.

Assign the ID number

To work properly in a PRONET network each connected device must have a unique identifier number, called ID. By default the USB2CAN PC controller has ID=0 and there can be only one PC controller. Every other device connected must have its own unique ID equal or greater than 1: in the network cannot exist two devices with the same ID.
An ID number is assigned automatically to each devices when they are turned on for the first time connected to a network.
In order to correctly assign a new available ID to each device for working properly in a Pronet network, follow these instructions:

1. Switch off all the devices.

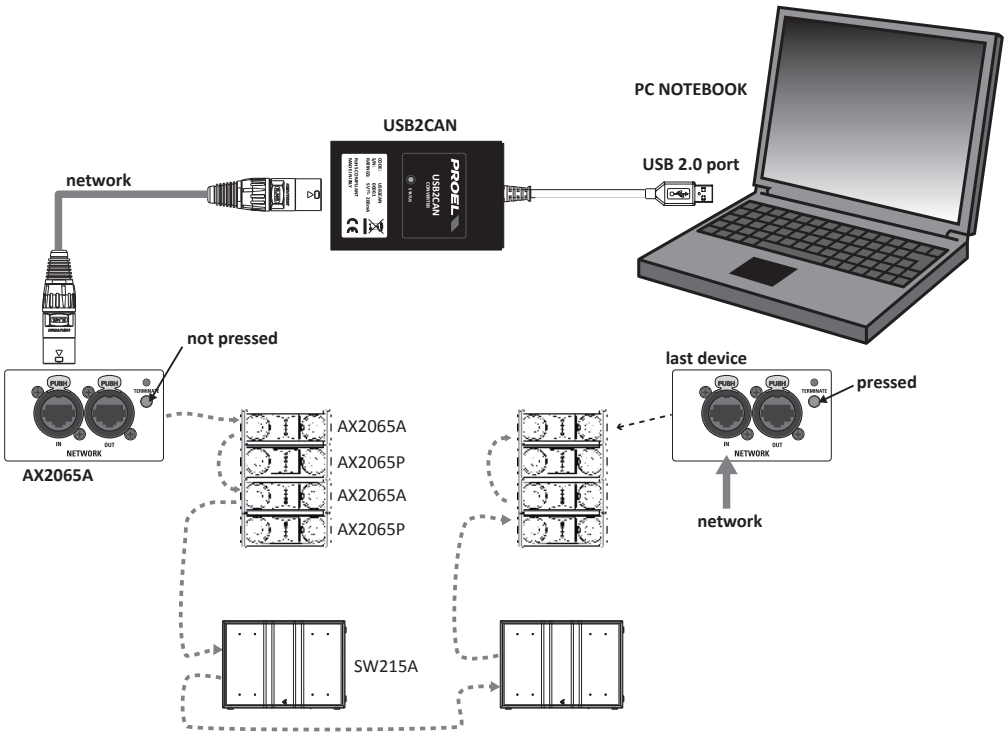
2. Connect them correctly to the network cables.
3. “TERMINATE” the latest device in the network connection.
4. Switch on the first device keep pressed “PRESET” button on the control panel.
5. Leaving the previous device switched on, repeat the previous operation on the next device, until the latest device is turned on.

The “Assign ID” procedure for a device makes the internal network controller to perform two operations: reset the current ID; search the first free ID in the network, starting from ID=1. If no other devices are connected (and powered on), the controller assume ID=1, that is the first free ID, otherwise it searches the next one left free.

These operations ensure that every device has it’s own unique ID, if you need to add a new device to the network you simply repeat the operation of step 4. Every device maintains its ID also when it is turned-off, because the identifier is stored in the internal memory and it is cleared only by another “Assign ID” step, as explained above. This means that if your network is made always of the same devices the assigning ID procedure must be executed only the first time the system is turned on.

For more detailed instruction about PRONET see the PRONET USER’S MANUAL included with the software.

EXAMPLE OF PRONET NETWORK WITH AX2065A AND SW215A



Useful tools to set up properly a vertical array system

This is a list of tools that can be very useful to set properly a vertical array system.

CABLE TESTER
It is a good practice to check all cables before each installation, because even one faulty cable can compromise heavily the system performance.

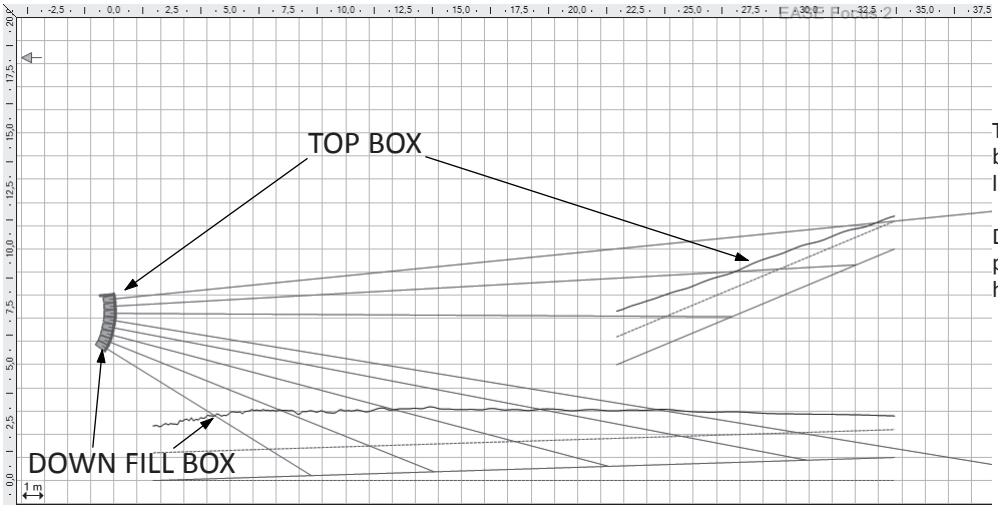
INCLINOMETER WITH LEVER
This tool can be used to verify the vertical array angle. It can be used at the top or at the bottom of the array In this case you have to sum all splay angles, so the maximum precision is needed for aiming the vertical array, particularly for long throw applications.

LASER DISTANCE METER
This instrument can be useful to measure the height of the vertical array and to know the distance between FOH-Subs and FOH-Array for setting the delay time.

SMAART or similar acoustic measurement system
These are useful to measure delays, phase and response of the system.

EXAMPLE OF INSTALLATION IN A THEATRE WITH BALCONY

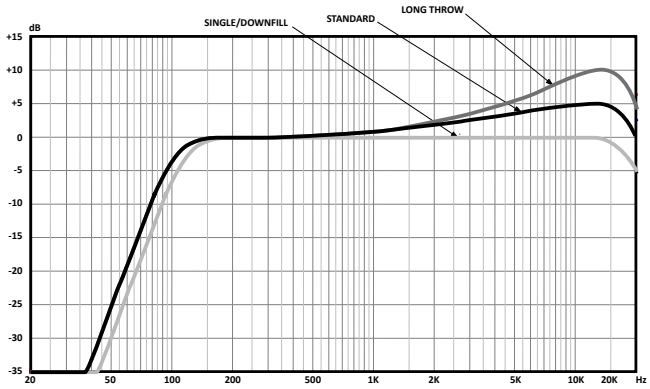
Here below you can see an example of the use of different PRESETS in an AX2065 flown array installed in a big theatre with balcony. The TOP BOXES of the array are aiming at the balcony while the DOWN FILL box is aiming at the audience close to the stage.



TOP BOXES: the power level at the end of the balcony is lower, as well as the high frequency level.

DOWN FILL BOXES: the power level in the proximity of the stage is higher, as well as the high frequency level.

AX2065A - PRESET RESPONSE



In order to optimize the array performances for this specific application, the PRESETS should be used in the following way.
Load the STANDARD preset in the central boxes.
Load the LONG THROW preset in the TOP 1 or 2 boxes, in order to compensate the loss of power level and high frequencies of the program sent the upper deck of the theatre.
Load the DOWN FILL / SINGLE BOX preset in the BOTTOM box in order to smooth the high frequency content of the program sent to the audience close to the stage.

LIMITED WARRANTY

Proel warrants all materials, workmanship and proper operation of this product for a period of two years from the original date of purchase. If any defects are found in the materials or workmanship or if the product fails to function properly during the applicable warranty period, the owner should inform about these defects the dealer or the distributor, providing receipt or invoice of date of purchase and defect detailed description. This warranty does not extend to damage resulting from improper installation, misuse, neglect or abuse. Proel S.p.A. will verify damage on returned units, and when the unit has been properly used and warranty is still valid, then the unit will be replaced or repaired. Proel S.p.A. is not responsible for any “direct damage” or “indirect damage” caused by product defectiveness.

- This unit package has been submitted to ISTA 1A integrity tests. We suggest you control the unit conditions immediately after unpacking it.
- If any damage is found, immediately advise the dealer. Keep all unit packaging parts to allow inspection.
- Proel is not responsible for any damage that occurs during shipment.
- Products are sold “delivered ex warehouse” and shipment is at charge and risk of the buyer.
- Possible damages to unit should be immediately notified to forwarder. Each complaint for package tampered with should be done within eight days from product receipt.

SAFETY INSTRUCTIONS

– To reduce the risk, close supervision is necessary when the product is used near children.
– Protect the apparatus from atmospheric agents and keep it away from water, rain and high humidity places.
– This product should be site away from heat sources such as radiators, lamps and any other device that generate heat.
– This product should be located so that its location or position does not interfere with its proper ventilation and heating dissipation.
– Care should be taken so that objects and liquids do not go inside the product.
– The product should be connected to a power supply mains line only of the type described on the operating instructions or as marked on the product. Connect the apparatus to a power supply using only power cord included making always sure it is in good conditions.
– WARNING: The mains plug is used as disconnect device, the disconnect device shall remain readily operable.
– Do not cancel the safety feature assured by means of a polarized line plug (one blade wider than the other) or with a earth connection.
– Make sure that power supply mains line has a proper earth connection.
– Power supply cord should be unplugged from the outlet during strong thunderstorm or when left unused for a long period of time.

CE CONFORMITY

Proel products comply with directive 2004/108/EC (EMC), as stated in EN 55103-1 and EN 55103-2 standards and with directive 2006/95/CE (LVD), as stated in EN 60065 standard.

PROEL S.p.A. (World Headquarter) - Via alla Ruenia 37/43 - 64027 Sant’Omero (Te) - ITALY
Tel: +39 0861 81241 Fax: +39 0861 887862 www.proel.com